Update on Preliminary Science Report

UC Berkeley; UC Davis; UCLA, NHI; UCS

Structure of studies

- Individual sector studies
- Overall economy-wide impact

Sectoral studies

- Agriculture
- Water
- Commercial forestry
- Fire
- Coastal resources
- Public health

Broad, varied approach

- Work from common set of scenarios
- In each sector review what is known, what can be said, qualitatively or quantitatively, about impact of scenarios, using case studies where appropriate.
- Identify, also, what is not known and what needs to be done to provide a more complete assessment in the future.

Approach continued

- Develop physical impacts
- Then trace this down to social and economic impacts
- Besides impacts, identify opportunities for adaptation policy
- Quantify economic impacts where possible
- Carry impacts through to rest of California economy

Some general observations

- There is necessarily some interaction between the economic analysis we perform and considerations of policy analysis.
  - When you ask a question such as “How much fossil fuel will be burned by the x industry” the answer depends partly on the constraints on firms in the industry, and partly on the incentives they face. Thus, the question cannot be answered completely without specifying incentives (i.e., policies),
  - Therefore impact analysis and mitigation analysis must come together.

- There are inevitable limits to what we can learn from an economic analysis because of potential:
  - Over-simplification and/or misspecification of economic model
  - Extra-model shifts in behavior/ preferences
  - Extra-model shifts in technology
  - Extra-model shifts in industry composition/structure

- While prices affect firm and consumer behavior, so does information, so does salience and mechanisms that grab agents' attention. These considerations are typically omitted from models.

A Couple of Economic Principles

- Climate change involves what economists call an externality, wherein a person undertakes an action that imposes an adverse effect on some *other* people.
- In the presence of externality, competitive markets are unlikely to generate an outcome that is in the public interest.
- Reliance on a purely voluntary approach to deal with externality is unlikely to be satisfactory or useful.

- There is uncertainty regarding the future consequences of current GHG emissions.
- But, the correct response to uncertainty is to take precautions, including the equivalent of the purchase of insurance. Reducing GHG emissions is an appropriate form of insurance.

Example: Agriculture & Water

- Agriculture, along with forestry, is the sector of the economy that is most directly affected by climate.
- Water supply is the single most important pathway by which most other sectors of the California economy will be affected.
- Both studies involve a suite of analyses by researchers at UC Berkeley & UC Davis.

Objective

- In both cases, the objective is to characterize, both qualitatively and quantitatively where possible, the implications of the climate change scenarios with respect to agriculture and water in California.
- The main focus of the quantitative analysis is the Central Valley, with some case studies of particular areas.

Climate impacts on agriculture

- Climate factors (atmospheric CO2 concentration, ozone, temperature, solar radiation) affect agricultural crops in multiple ways.
- They affect photosynthesis, vegetative development, crop yield and quality, and crop-water relations, as well as insect pests, diseases and weeds.
- These have been studied mainly at the leaf level and in isolation, but not so well at the whole-plant level and in combination.

Agricultural Analysis Activities

- A combination of literature review plus some original research.
- Goal is to assess impacts on major California crops with respect to crop yield, quality, ET needs, and production costs.
- These estimates will feed into economic analyses of the agricultural and water sectors in California to assess impacts on farm income, farm employment, commodity prices etc.

Agricultural analysis contd.

- UC Davis researchers are producing a summary of papers presented at UCD Climate Change Symposium in May.
- UC Berkeley researchers are using existing crop growth and ag pest models, and conducting regression analysis of some new data, to generate specific analyses of climate change scenario impacts on agricultural pests and crop water use, yield and ET for major crops.

Economic impact on California ag

- The resulting changes in yield, crop ET, production costs will be factored into CVPM (at Berkeley) and CALVIN (at Davis).
- These will be combined with scenarios of future surface water supply (from water impact study).
- External future economic changes (e.g., world food demand, urbanization in Central Valley) will be included to the extent possible.

Impacts on California water

- Climate change scenarios translate into changes in surface runoff and streamflow for river basins in the Central Valley.
- The streamflows are fed into water system models to generate changes in surface water availability for agricultural and urban water districts in the Bay area, Central Valley, and Southern California.
- These also affect groundwater pumping; and hydropower production.

Impacts on California water contd.

- The changes in surface water supply lead to some re-allocation based on water right and water contract priorities, as well as water market transfers.
- The changes in surface water availability and groundwater pumping depth affect agricultural and urban water users, and generate impacts on income, employment and consumer's surplus.
- They also generate economic impacts on hydropower supply.

Water impact analyses

- At UC Davis, the CALVIN model will take the streamflow hydrologies being generated by Ed Maurer and analyze hydrologic/economic impacts.
- At UC Berkeley, the streamflow hydrologies will be run through CALSIM, CVPM and a new urban demand model for a statewide analysis. Also, the climate change scenarios will be run through the modified NHI-WEAP model of the Sacramento Valley to generate hydrologic/economic impacts there.

Adaptation strategies

- Both the agricultural and water sector analyses will be reviewed to identify relevant adaptation strategies for state and local governments and for other agricultural and water sector groups.
- The policy and research implications of these strategies will be elucidated.

Deliverables

- Report on impacts of climate change scenarios on California agriculture.
- Report on impacts of climate change scenarios on agricultural and urban water users in California.
- Discussion of potential adaptation strategies for agriculture and water in California.

ECONOMYWIDE IMPACTS

- The overall economic impacts are analyzed using the BEAR model, a computable general equilibrium model of the California economy.
- The sectoral economic impacts from agriculture, water, and forestry will be fed into the BEAR model to identify statewide economic impacts and economic adaptation policies.